PRIMARY CARCINOMA AND SARCOMA OF THE APPENDIX VERMIFORMIS.*

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PRIMARY carcinoma of the appendix has been a subject which has interested both surgeons and pathologists for many years. A great deal of work has been done on this subject both by pathologists and surgeons, although it has been regarded by many as a very rare condition and by some, rather as a surgical curiosity. In looking over the literature, we find that the first case where malignancy of the appendix was recognized was by Merling[30] as far back as 1838. Since that time many cases have been collected, and in analyzing these cases we find that many of those reported are very imperfectly described and cannot be put down as primary cases of carcinoma involving the appendix, as many of them have their origin in the cæcum or else are the result of metastasis from other portions of the infected abdominal viscera. It is interesting to note that in a majority of the cases analyzed we find that most of them are reported by American authors. The great majority of these cases had some acute or chronic inflammatory lesion which was responsible for the symptoms demanding operation. Some few of them were found, however, in autopsies as the result of routine examination of the appendix.

As to the frequency of malignant disease of the appendix, nobody can deny that this condition is becoming more frequently recognized as the result of more systematic and careful examination of all appendices removed, as is shown by the number of cases collected and reported from the Bender Laboratory in Albany. There is little doubt that many cases of malignancy were overlooked, in which it was supposed that a macroscopical examination was all that was necessary to demonstrate whether an appendix was slightly inflamed, or whether it was the seat of a neoplasm.

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In response to a letter which was sent to the Fellows of this Association, asking for a report of cases of malignant disease of the appendix occurring in their practices, a large number of answers were received, many of the Fellows stating that they had had no experience with this condition. In some of the cases received the diagnosis was not entirely borne out by microscopical examination, and we were therefore forced to exclude them from our list. We were successful, however, in collecting 9 cases which had not been previously reported. In 1902 the author reported two cases at the Albany Meeting of this Association, in which the diagnosis was verified by a thorough microscopical examination. One of these cases is in perfect health to-day, but the other patient has been lost sight of. Since that time three other cases have occurred in our practice; in two of them the condition was found as the result of routine operation for appendicitis; in the other, a patient of Dr. Meigs, a neoplasm was found at autopsy, the patient having died of lobar pneumonia at the Pennsylvania Hospital.

We have collected from various sources 92 cases of primary carcinoma of the appendix; to this number may be added 9 cases collected by the author, the most of which have occurred in the practices of the Fellows of this Association. It will, therefore, very readily be seen that the condition ceases to be a rarity.

Zaaijer[64] mentions that 18 cases of carcinoma were collected from a total of 2322 autopsies for appendicitis; we think it probable, however, that this number is too small, as in many of these 2322 cases the appendices were not examined microscopically. If this procedure is not carefully carried out many cases will be lost: in one of our own cases the detection of malignancy was recognized only after several sections had been cut through different portions of the appendix.

Baldauf[1] states that about 1 per cent. of all inflamed appendices removed will be found to be malignant to a more or less degree. This malignancy depends for its severity in a great measure upon the time of life in which it is detected. For instance, carcinomas of the so-called basal celled variety, as described by Warthin,[59] arising in young subjects, seem to be much less malignant. Baldauf's percentage appears large when compared with the results of older observers, but this difference is attributed by some to the more accurate methods of examination now being employed. Kelly[28] explains it by the fact that carcinoma of the appendix often causes perforation or gangrenous inflammation in its early stages. But there appears to be another factor at work:—If appendicitis is the cause of appendiceal carcinoma, an increase in the former will cause an increase in the latter, and vice versa. An increase in the frequency of carcinoma of the appendix will be an important argument in favor of assuming an increase in appendicitis.

The question of carcinoma of the appendix must be investigated from both an anatomical and a clinical side. We find that in nearly all the collected cases the operation was performed for the relief of symptoms of appendicitis of either an acute or chronic variety. The condition of the appendix was found on careful microscopical examination. In many instances the inflammation had lasted for a period of years, and in some instances it would seem that the inflammation antedated the cancer. A point worthy of attention is that few cases of carcinoma of the appendix have occurred where there was an acute inflammation, but when this has occurred it has in all probability been an acute attack grafted on an old case of chronic inflammation of the appendix. That chronic inflammation plays a very important part in carcinoma of the appendix is shown by the fact that a large percentage of the tumors were found in the tip of the appendix which had previously been obliterated by chronic inflammation. Some tumors were detected throughout the organ, and a few were found in a totally obliterated appendix.

These facts therefore go far to prove that this neoplasm has a strong predilection for developing in the seat of a previously chronically inflamed appendix.

The age of the patient in which we find appendiceal carcinoma is of no little interest. If we tabulate those cases in our list we have:

Under 10 years of age	4
From 10 to 20 years of age	13
" 20 " 30 " " "	34
" 30 " 40 " " "	21
" 40 " 50 " " "	7
" 50 " 60 " " "	4
" 60 " 70 " " "	2
" 70 " 80 " " "	2
" 80 " 90 " " "	1
Age not stated	4
Total	92

(Average age of all cases was 29 years.)

Of this number 41 were males, 59 were females, and in 9 the sex was not stated. Age not mentioned in 4 cases, of which 2 were males, and 1 was a female.

We have also been able to collect 6 cases of sarcoma of the appendix, of which 4 were males and 2 females. The respective ages of these patients were 45, 39, 27, 55, and in 2 cases the age was not stated.

The question may naturally arise, why does the age of malignancy in the appendix differ so greatly from the age at which malignant disease is found in other organs of the body, but this can be answered by the fact that a large percentage of all carcinomatous appendices are found as a result of operations for appendicitis, and most operations of this character are done between the ages of ten and forty years. Therefore, the above deduction cannot be said to be true, but is simply applicable to the usual age at which operations for appendicitis are performed.

The tumors, although almost always very small, vary greatly in size,—from microscopical size to the size of a normal ovary. As we know little about the early stages of intestinal cancers, it may be that similar cancers can be found in other parts of the intestine in young individuals; if so they are usually overlooked at autopsies, and we might therefore say that very small cancers of the appendix make their appearance from ten to thirty years earlier than the large evident intestinal tumors presenting clinical symptoms.

The appendiceal tumors will give rise to symptoms apart from those accompanying appendicitis only when the growth has extended to the surrounding tissues, invading the cæcum and becoming a carcinoma of this organ, for by this time the appendix has lost nearly all its characteristics and is hardly recognizable as the primary seat of the growth. We are of the opinion that these cæcal cancers originating in the appendix are apt to occur later in life, usually between 40 and 60 years, and have a marked tendency to metastasis and recurrence. Many writers concede the appendiceal origin of cæcal cancers, believing them to spring from some cancer-nest in an old, chronically inflamed appendix, after the patient has reached the age of 40 to 60 years. So obscure is this subject that light can be thrown upon it only by the fundamental revision of cæcal carcinomas, and by the careful study of all future cases.

Our experience with recurrence of the disease in the cæcum after removal of the appendix for carcinoma has been very limited, but there is no doubt that in a certain number of cases the condition does recur in the cæcum.

It would seem probable that the cases of primary malignancy of the appendix so far reported fall into two classes—first, the columnar-cell type, as found in the stomach, intestine, and other parts of the alimentary tract, and second, the spheroidal-cell type which closely resembles the basal-cell carcinoma of the skin. In this latter class Rolleston and Jones[62] would place the great majority of primary cases of appendiceal carcinoma, and we think it probable that many cases described as endothelioma and sarcoma are in reality this type of carcinoma. Warthin is of the opinion that the vast majority of reported cases of malignant tumors of the appendix are to be classed as basal-cell carcinomas. This theory would seem also to be borne out by the age incident: the average age of 14 cases described as spheroidal-cell carcinomas was 24 years, while the average age of the cases described as columnar-cell carcinomas was about 50 years, which more nearly corresponds to the average age at which primary carcinoma of the intestine occurs. We may therefore consider that basal-cell carcinoma of the appendix is a disease occurring in early adult life, the earliest observed case being about 7 years of age, reported by Oberndorfer.[45] The basal-cell type is characterized by its relatively slight malignancy, and it does not tend to set up metastases or to recur after operation. In cases of columnar-cell type the prognosis is not favorable. This fact is only another evidence of the importance of basing the ultimate diagnosis and prognosis upon the precise histological study of the neoplasm.

Rolleston and Jones in a number of cases removed the appendix during life, but the nature of the disease had not been suspected in any case prior to operation. In three of their cases a portion of the cæcum at the base of the appendix was removed, and in two cases a more radical operation was necessary. Recovery is definitely stated to have occurred in the majority of the cases.

Zaaijer[64] believes that the difference in the age at which the principal types of carcinoma occur in the appendix is so small that one cannot say that any one type of carcinoma is more apt to occur at any stated age than is another type, but we think an exception may be taken to this statement in the occurrence of the so-called basal-cell type, which, as has already been stated, has been found most frequently in young subjects.

The principal mass of the tumor is generally to be found located in the mucosa and the submucosa and in the central connective tissues which replace these layers in obliterative appendicitis.

After a careful consideration of the collected cases we agree with Ribbert's[49] theory regarding the histogenesis of carcinoma of the appendix, *e.g.*, that the tumors develop from epithelial nests which have been loosened from their attachments and which find the chief cause of their detachment in the chronic connective tissue inflammation. It is difficult to determine the starting point of many of these small tumors, but it would appear that the disease starts in the mucosa, which becomes replaced by spheroidal-cell growths from the Lieberkuhn crypts.

After having considered in a measure some of the clinical and pathological signs of cancer of the appendix are we able to build any hypothesis which will assist us in making a positive diagnosis of cancer of the appendix via other than the classical signs of appendicitis, such as pain, with which it is so closely associated? Let us, therefore, consider the classical signs of appendicitis, namely, pain, tenderness, presence or absence of a mass, rigidity, temperature, pulse, blood, history of previous attacks, age, sex and the question of heredity.

Pain in the region of the appendix is so common in all intraperitoneal irregularities that no dependence can be placed upon this symptom beyond indicating an inflamed appendix.

Tenderness and pain go hand in hand so often in all forms of appendicitis that it is of little diagnostic value.

The *presence of a mass* can be determined only if the disease has invaded the cæcum, and often from this sign, in the absence of any acute inflammatory action, the diagnosis of malignancy can be made. In one of my cases however the appendiceal tumor was as large as an ovary, and yet nothing could be palpated, simply because the neoplasm was floating loosely, attached to a long appendix and meso-appendix. The author feels very skeptical with regard to the asserted ability of some surgeons to palpate appendices which on opening the abdomen were only located after a long and diligent search.

Rigidity will be noticed only in proportion to the amount of pain that is experienced or irritation caused, especially when the abdomen is palpated, and this rigidity is simply an attempt on the part of the muscles to protect the inflamed and irritated appendix from injury. It is always seen where there is any intraperitoneal irritation, arising from any source.

Temperature.—It is questionable if any deductions other than an inflammatory condition, can be drawn from this symptom. Moschcowitz mentions a curious temperature rise in one of his cases, but this appeared to be dependent upon some autointoxication entirely foreign to the appendix.

Pulse.—It would be impossible to expect to draw any deductions from this source beyond a distinct rise in the temperature or an acute inflammatory condition.

Blood.—If the disease in question has advanced and is causing much local irritation, a distinct leucocytosis might be expected. On the other hand, in microscopical cases I question if any data can be gathered from the most elaborate study of the blood picture.

The *history of previous attacks* is important, bearing considerable relation to both the symptoms and the prognosis. It appears that nearly, if not all, cases of cancer of the appendix have been ushered in by attacks which were supposed to have been appendiceal, but it is only after the removal of the appendix that the exact condition reveals itself. It generally shows that the carcinoma has selected for its site a previously chronically inflamed appendix. This view has been strengthened by the observations of Letulle and Weinberg and was undoubtedly true in the four cases upon which the author has operated. Patients are apt to be so inaccurate in their statements with regard to former attacks of appendicitis, confusing the symptoms with those of cold, indigestion or slight abdominal cramp, that deductions placed upon such information are of practically no value. Moschcowitz, in analyzing a number of cases, states that 66 per cent. of carcinomas were preceded by acute inflammatory symptoms. The symptoms in some few cases may be caused by a small neoplasm impinging on the lumen of the appendix, causing a stenosis which will cause symptoms of appendicitis. I am strongly of the opinion that in the appendix, as in other portions of the body, malignancy tends to develop in previously chronically inflamed and irritated areas, and consider this a strong argument for the removal of all offending or troublesome appendices.

The question of the *age of the patient* has already been spoken of at some length. Most of the collected cases of carcinoma of the appendix have been procured from operative statistics, the operations being, as a rule, performed on patients between the ages of five and forty years. The natural conclusion, therefore, would be that carcinoma develops in appendices most frequently at the time of life in which the acute inflammation of the appendix is most common, but this is simply because the condition is disclosed at operation.

The sex of the patient noted in the appended table was given in 100 instances; of these 41 were males and 59 females. The anatomical relations in both sexes are identical, with the exception of an occasional appendiculo-ovarian ligament. Nevertheless, the greater frequency of the condition in the female is worthy of note.

In cancerous diseases *heredity* is a factor which must not be lost sight of, especially where the examination of a patient who has passed into the cancer zone is concerned. The author's last patient operated upon was 41 years of age, and at the time of his operation his mother was suffering from an advanced scirrhus of the breast, from which she subsequently died.

After carefully considering the various signs, symptoms, and pathological data relative to primary cancer of the appendix, we arrive at the following conclusions:

1. Primary carcinoma of the appendix is present in from ⅓ of 1 per cent. to 1 per cent. of all cases operated upon for chronic appendicitis. But few cases are collected at autopsy.

2. Institutions which make a thorough microscopical examination of all appendices removed at operation and at autopsy will report a larger percentage of cases of carcinoma of the appendix.

3. Carcinoma of the appendix, especially of the basal- or spheroidal-cell type, is a condition of early life, occurring generally between the age of 10 and 40. There is little tendency to metastasis and the origin of the disease is, as a rule, in the mucosa.

4. The disease appears to be slightly more frequent in females than in males.

5. Acute and chronic inflammations are present and are responsible for the symptoms demanding operation. The growth, while localized, gives no pathognomonic symptoms.

6. The fact that primary carcinoma of the appendix

takes its origin in an inflammatory process forms a very strong argument for the removal of all appendices which show evidence of any irritation.

The histories of the unreported cases which the author has been able to collect are as follows:

CASE I.—G., man, aged 30. Carcinoma of the appendix was discovered at autopsy after death from lobar pneumonia. Patient of Dr. Arthur V. Meigs at the Pennsylvania Hospital. Admitted 1-21-'04. Died 1-23-'04. Family history negative. Had rheumatic fever at thirteen and has had quinsy several times and pleurodynia once. Caught cold on the 17th ult. and developed typical attack of pneumonia. Physical examination on admission, negative except as to pulmonary condition. Patient was wildly delirious before death. Temperature averaged 104° F. There were no symptoms pointing toward the appendiceal condition.

Autopsy No. 513. Ayer Clinical Laboratory.—Anatomical diagnosis: Acute lobar pneumonia, double acute fibrinopurulent pleurisy, fibrinopurulent pericarditis, congestion and œdema of the lungs, acute splenic tumor, cloudy swelling of kidneys and liver, primary adenocarcinoma of appendix. There were no evidences of metastasis. The appendix measures six cm. in length and lies behind the cæcum pointing downwards. There are no adhesions. The appendix ends in a bulbous, whitish tip which curls around much as a snail shell and is slightly adherent to itself at the distal part only. This bulbous end measures about two cm. in diameter. The thickening and enlargement occurs very suddenly, and measures about five cm. in length. The curled tip shows many injected vessels over its surface and a few minute, pinhead-sized nodules.

On section through the curled tip, what represents the lumen appears as a solid, round, regular, well-defined mass, seven mm. in diameter. It is streaked yellow and gray and bulges considerably.

Microscopical Examination.—Sections through the bulbous tip: The entire central portion of the appendix is filled with an adenomatous growth. The gland spaces are separated by delicate connective tissue trabeculæ. Some of the spaces are lined by one or several layers of columnar or cuboidal epithelium, usually separated from the wall. Others are almost filled with loose epithelial cells. Surrounding this are the muscular tissues, which are infiltrated with narrow strands and groups of cells like those in the mucosæ.

CASE II.—Personal communication from DR. C. H. MONKS.—X. Y., age 24, a strong well-built woman, who had previously been troubled more or less with indigestion for an indefinite period, entered the Boston City Hospital in September, 1902, with symptoms of appendicitis, from which she had suffered for two days. This illness began with pain which was more or less general over the abdomen; later becoming limited to the lower half. No vomiting, and bowels were easily controlled with enemata. The general condition of the patient on admission was good and pain was not severe. . Temperature, 100.5; pulse, 100. No spasm of abdominal muscles; moderate tenderness in region just below and to the right of umbilicus and also in corresponding region in left side. The diagnosis of chronic appendicitis was made and the appendix was removed a few days later and externally presented the appearance of chronic inflammation.

Pathological Examination: Appendix 5 cm. long. Mesentery adherent with some fat. Surface reddened. Small dilated blood vessels easily seen. Mucous membrane grayish and gelatinous. Yellowish nodule 0.6 cm. in diameter found 1.5 cm. from distal end.

Microscopical Examination: Slight infiltration of muscularis under submucosa with lymphoid cells. At site of tumor the mucosa is entirely replaced by a mass composed of connective tissue surrounding collections of epithelial cells.

Diagnosis: Adenocarcinoma; chronic appendicitis.

The patient made an uneventful recovery from the operation and was discharged twenty-four days later.

Five and one half years after the operation the patient was thoroughly examined and no evidence whatever of recurrence was seen and she was enjoying the best of health.

CASE III.—Personal communication from DR. JOHN C. MUNRO.—J. F. F., aged 47; Irish laborer. Admitted April 3, 1906. Discharged April 30, 1906. Family history negative. Previous history: Two weeks before operation he had an acute attack of general abdominal pain localizing in appendiceal region and accompanied by nausea and vomiting. Pain and tenderness subsided gradually in three days, but there has been an exacerbation of these symptoms about every other day since attack began. Lost seven pounds and had no appetite.

Physical examination: Well-developed and nourished; has non-movable mass the size of tennis ball in right iliac region; there is tenderness but no spasm.

Operation: Operation by Dr. Bottomley April 4. Rectus incision, rather higher than usual, over mass. Very hard irregular mass to outer side of cæcum to which it was slightly adherent.

Appendix removed by peeling out mucous and submucous coats. That the tumor was malignant was not realized until the pathological report was received a few days later. Cigarette drain placed and wound partly closed as there was some oozing. There was a purulent discharge for a few days, but recovery was uneventful.

Microscopical examination of the appendix shows it to be infiltrated with carcinoma of a cylindrical-cell type.

A secondary operation was urged as soon as the nature of the lesion was known but patient refused. Patient was examined March, 1908, and no evidence of metastasis could be found. Patient seemed in perfect health.

CASE IV.—Personal communication from DR. A. T. CABOT.—Miss P., aged thirty years. Operation, 1907. Had symptoms referable to appendix, and operation for removal showed appendix to be twisted.

Microscopical Examination: The specimen consists of a very much curled up appendix, bound down by adhesions. The epithelium of the glands of the mucosa has undergone a very curious atypical growth which in places presents the histological picture of a carcinoma but lacks the infiltrating character of such a growth. There is a large amount of chronic inflammatory tissue present.

This operation was not followed by as complete a recovery to comfort as was to have been expected, and when this condition described by Dr. Wright was known I remembered that I felt a little nodule down, seemingly, on the wall of the pelvis, which at the appendix operation I could not bring into view, and which I thought was simply a little fibroid. On January 14, 1898, I again operated. At that time the patient was in better weight, and had been having better digestion; looked distinctly better than when I had seen her in May. Examination under ether showed the right ovary fixed on the side of the pelvis and enlarged; although not greatly so. Upon opening the abdomen I found the ovary as it had been felt by examination, and close above it was a little hard mass which was situated in the side of the Fallopian tube. The ovary and the whole Fallopian tube were ligated and cut away. The other ovary seemed in good condition, and the uterus was in good position, so that it was not fixed by suspension. The Fallopian tube presented a pea-sized nodule in its wall. This nodule is due to the presence of carcinomatous tissue in the wall of the tube as demonstrated by microscopical examination. The patient was heard from in 1907, when she still had considerable pelvic distress, and a second operation for removal of other ovary, etc. At this time the organ removed showed no sign of carcinoma.

A re-examination of the sections of the appendix by Dr. J. H. Wright in the case of Miss P. convinced him that the condition in the organ is carcinoma. The carcinomatous tissue consists of large and small columns and masses of atypical epithelium-like cells imbedded in a variable amount of connective-tissue stroma. The cells are generally smaller than the general run of carcinoma cells and do not form tubules as is commonly the case in cancers of the intestine. In a few places there are appearances suggesting the origin of the carcinoma cell masses from the dilated tubules of the mucosa. The tumor tissue does not appear to infiltrate the outer layers of the muscular coat of the appendix.

A re-examination of the sections from the Fallopian tube reported under the date of January 15, 1898, shows a carcinoma in the wall of the tube. There is no involvement of the mucous membrane. The carcinoma shows, generally, narrow columns of epithelial-like cells imbedded in a moderate amount of stroma. The cells in general are larger than the cells of the carcinoma of the appendix. There is nothing, however, inconsistent with the idea that this carcinoma of the Fallopian tube may be a metastasis from the carcinoma of the appendix.

CASE V.—Personal communication from DR. A. VANDER VEER.—Report from the Bender Laboratory of the Albany Hospital. Miss M. A., aged fourteen. Clinical diagnosis: acute appendicitis. Operation by Dr. Sibley.

Specimen consists of a swollen and previously sectioned appendix measuring 6.5 cm. in length. The external surface is covered in places by an exudate of rather adherent, yellowish-white material. All coats are thickened. Mucosa presents numerous punctate hemorrhages and is ulcerated in patches. Two cm. from the proximal end there is a slight thickening of the tissues, particularly of the mucosa. Anatomical Diagnosis: Acute diffuse and ulcerative appendicitis. Acute fibrinopurulent periappendicitis.

Microscopical Description: On section all coats are thickened and infiltrated by polynuclear leucocytes. Exudation of lymph on peritoneal surface. Mucosa ulcerated in patches. Other sections show all coats to be invaded by irregularly branching and anastomosing columns of polyhedral cells.

Microscopical Diagnosis: Carcinoma simplex of appendix. Acute diffuse and ulcerative appendicitis. Acute fibrinopurulent periappendicitis. Patient was in good health three years after operation.

CASE VI.—Personal communication from DR. A. VANDER VEER.—Report from Bender Laboratory of the Albany Hospital.

Miss W. P., aged thirteen. Clinical diagnosis appendicitis. Operation by Dr. Hacker.

Specimen consists of a markedly thickened appendix, firmer than normal and measuring 4 cm. in length. The peritoneal surface is pinkish-red, has firm fibrous tags attached, and 1 cm. from the tip, presents a small perforation which communicates with the lumen; the tissues about this opening are greenish-black. The lumen is patent throughout. The mucosa is pinkish-gray, shows numerous spots of ecchymosis and is everywhere thickened. Accompanying the specimen is a strip of omentum 8 cm. in length which shows at one end a fibrinopurulent exudate. It is deep red and has fibrous tags attached.

Anatomical Diagnosis: Chronic appendicitis with acute exacerbation, gangrene and perforation.

Microscopical Description: Section shows the mucosa to be atrophied and in some places entirely absent. The stroma about the gland follicles shows eosinophilic infiltration. The lymph-follicles are enlarged and show young connective-tissue infiltration. At one side of the section in the submucosa is an area containing but little connective-tissue stroma, showing numerous clefts filled with masses of large cells with deeply staining nuclei and having no definite arrangement.

Microscopical Diagnosis: Carcinoma of appendix. Chronic appendicitis with acute exacerbation and necrosis.

CASE VII.—Personal communication from Dr. A. VANDER VEER.—Report from Bender Laboratory of the Albany Hospital. Miss K. B., aged twenty-one. Clinical diagnosis was chronic appendicitis.

Specimen consists of a previously sectioned appendix. Distal two-thirds considerably thickened. The peritoneal surface shows numerous dilated blood vessels and at the distal extremity firm red tags. At the junction of the middle and proximal thirds the lumen is obliterated and the distal end is considerably thickened and filled with a greenish fecal mass. The mucous membrane of the distal two-thirds is grayish-red, showing spots of hemorrhage. The remainder of the mucosa is apparently normal.

Microscopical Description: Sections of appendix show mucous membrane diminished in amount and crowded together, the lumen being obliterated. There is an increase of connective tissue in the submucosa and there are numerous newly formed blood vessels. The muscular coat shows a moderate, small lymphocytic infiltration and the peritoneum is œdematous and has irregular tags of delicate, œdematous tissue interrupting its free surface. In the submucosa there is a growth composed of areas of cells with large, deeply staining, vesicular nuclei separated by strands of connective tissue and arranged in alveolar form. The connective tissue surrounding this new growth is deeply infiltrated with small round cells. The new growth is more or less circumscribed and pushes aside a portion of the mucous membrane.

Microscopical Diagnosis: Chronic obliterative appendicitis. Primary carcinoma of the appendix.

CASE VIII. HARTE. Admitted to Pennsylvania Hospital 10-17-'07; discharged 11-7-'07. G. P., man, age 41. Came to the hospital complaining of slight dull pain, soreness, and some tenderness in right iliac region for the past three months. Mother operated upon for carcinoma of the breast two months ago. History otherwise negative. Always robust and healthy except for appendiceal trouble and an attack of typhoid fever at fifteen. No venereal history.

Present illness dates back about two years when he had abdominal pain and tenderness, vomited and was slightly constipated; was compelled to go to bed for a day or two. The following week had another attack and subsequently had slight attacks of abdominal pain and discomfort lasting two to three days, every month, for three or four years; attacks then decreased in frequency up to about four months ago, when they recurred with increased severity and pain and tenderness in right iliac fossa became more pronounced and he had some slight nausea and constipation. Appetite good. Condition remained about the same until his operation.

Physical Examination: Well built man; heart, lungs and urine negative. Abdomen negative.

Operation (Dr. Harte): Incision in right rectus. Mass four by eight cm. in size found lying free in right iliac fossa and continuous with appendix. It was very much like a swollen testicle. Mass removed and appendiceal stump inverted in the usual manner. Incision closed in layers and supported with through and through silkworm gut sutures. Uninterrupted convalescence. Wound healed nicely.

Pathological Examination: The specimen consists of a large, more or less egg-shaped cyst which measures approximately 6 or 7 cm. in length and appears as large as a goose egg. The cyst has been opened but the contents are still adherent to the wall.

It is a soft, sticky, jelly-like material, part of which is opaque and yellowish-green, parts seem translucent and dark yellow in color. Here and there are small masses of blood.

Altogether the contents of the cyst measures at least 100 c.c. The outside of the cyst is quite irregular in appearance. It is generally of a pinkish color and shows many injected vessels. Over all parts of the external surface there are irregular white thickened patches ½ to 2 cm. in diameter, which are quite firm and definitely raised. The margins are quite well outlined. Some of them extend down toward a line of fat which is taken to be the meso-appendix and which extends throughout the cyst along one surface. This meso-appendix is rather small.

At the proximal end of the cyst there is a narrow stump which looks like the appendix. This measures about ½ cm. in length and a little over ½ cm. in diameter. The wall of this small bit of appendix is continuous with the wall of the cyst, though the appendix begins very suddenly. The stump of the appendix as well as the cyst has been opened.

Only a few mm. at the extreme proximal portion suggest in the least a normal appendix. Here the lumen seems to be lined with a soft mucous membrane. The area between this and the cyst is filled with a fairly firm, opaque, yellow material which apparently has occluded the appendix.

The incision which was made in the operating room continues through the mass, which was cut in two, and into the cyst. It can not be told, now, whether there was communication between the cavity of the cyst and the lumen of the proximal end of the appendix. The wall of the cyst, where the gelatinous material has been removed, appears very irregular and has a lumpy appearance. It is lined by what looks to be a thin yellowish parchment-like membrane. In places the yellow-like material is quite firmly attached to the wall.

When some of the nodules on the serous surface are cut into they seem to be of an opaque, firm, yellow material.

Sections through the proximal end of the appendix show the following appearance: The subserous coat looks somewhat congested, thickened and contains fairly large accumulations of small round cells. The muscular walls are thick and the inner circular coat is two or three times the thickness of the outer longitudinal coat. Besides the thickening there is much degeneration in the muscular coats. The fibres are swollen, hyaline and separated by a great deal of loose connective tissue. In the submucosa, which is rather thin, there are localized accumulations of small round cells, often with centres composed of large pale cells. These are taken to be the remains of lymphoid follicles. There is an increase in the connective tissue in the submucosa. The normal mucosa is entirely lost. In its place there is a thin layer, of what appears to be hyaline fibres separated by a few connective tissue cells. On the surface of this hyaline material there are very curious cells. These are large irregular cells, sometimes elongated or goblet-shaped and projecting toward the lumen of the appendix. Many of them are filled with refractal granules. They are of a great variety of shapes and sizes. Many of them contain two nuclei, some appear as giant cells containing four to twenty nuclei or more. The nuclei are rather small, elongated and deeply staining. Covering these cells is a layer of hyaline looking material which contains cell remnants and red blood corpuscles; near the lining cells this material stains blue in hæmatoxylin, towards the centre it stains pink in eosin. This material corresponds to the jelly-like contents of the cyst. The small nodules between the proximal portion of the appendix and the neck of the cyst show in two sections different appearances.

In one section the nodule is composed of connective tissue infiltrated with small round cells, cells of epithelioid and plasma-cell type, and shows spaces, particularly near the surface, containing the hyaline material. Covering the surface of this nodule there is an irregular fringe of large cells described before. Great numbers of very large giant cells are seen and mixed with them are the elongated and columnal cells of epithelial type. This large cell gradually mixes with the blue-staining cyst contents.

Sections through another nodule show a definite carcinoma simplex. The cells are rather small, irregularly polygonal, have deeply staining nuclei and lie closely packed in spaces of various sizes. Some of the spaces are quite large but there are rarely degenerative changes in the centre. No definite karyokinetic figures are seen. The masses of cells infiltrate rather extensively the underlying muscular coats and in the nodules are separated by a moderate amount of connective tissue.

Sections through the wall of the cyst show much the same appearance as sections through the wall of the proximal part of the appendix.

The muscular coats are more irregular, sometimes being thick, sometimes thin and the accumulations of small round cells in the tissue above the muscular coats is more extensive and more diffuse. The lining membrane is practically the same and shows great numbers of giant cells. Sections through the hard masses in the cyst wall show them to be composed of old hyaline connective tissue.

Anatomical Diagnosis: Carcinoma of the appendix. Cyst-formation with muciginous contents.

Case IX.—Harte.—M. K., woman, age 39. Admitted 2–19–'03. Discharged 3–30–'03.

Previous History: Patient has been sick three days with severe pain and tenderness in right iliac region; bowels have not moved for four days; no vomiting and no fever. Has never had similar attack before but has had three attacks of gastritis.

On admission: Temperature, 102.2°. Abdomen fat; distinct rigidity of right rectus, with marked tenderness in right iliac region, where there is also increased resistance. Urine: Very faint trace of albumin and a few hyaline casts; otherwise negative.

Operation (Dr. Harte): Under ether an incision was made in right iliac region and appendix was found to be thickened, inflamed and very rigid, being practically broken off about 1 cm. from its base. Slight adhesions, no pus. Stump of appendix was ligated and excised. Wick of iodoform gauze carried down to bottom of cavity and wound partly closed. Slight fecal discharge which lasted a short time but closed before the patient left the hospital. On discharge there could be felt an irregular, hard mass in region of the wound. Pathological diagnosis: Primary carcinoma of the appendix.

Specimen consists of a small piece of fat and connective tissue about the size of a hickory nut, in the centre of which there is some gray necrotic material. On section the lumen of the appendix is found imbedded in the mass. The mucosa is swollen and red.

Microscopical Examination: The appendix is the seat of the most extensive changes. No coats but the external muscular can be made out. Everywhere there is extensive infiltration of polymorphonuclear leucocytes and the production of new connective tissue. The lumen is filled with leucocytes and desquamated epithelial cells. Glands are found only in what remains of the mucosæ in one or two sections; they extend from the surface, where here and there the remains of superficial epithelium can be seen, down deep into the appendix wall. They form long irregular ducts or spaces, lined sometimes by several layers of cuboidal or polygonal epithelium, and sometimes completely filled by such epithelium; often the layers of cells are detached from the wall of the space. These irregular ducts and spaces extend into the muscular coat. The stroma of the mucosa and submucosa is entirely destroyed or altered so that the coats are formed of granulation tissue densely infiltrated with polymorphonuclear leucocytes and small round cells. This acute inflammation extends about the appendix into the mesentery and fatty tissues. The growth of ducts and alveoli becomes more irregular and atypical the further they are removed from the lumen of the appendix. They extend into the mesentery and invade the granulation tissue of the region. Sometimes distinct atypical gland-like arrangements exist. The cells forming the invading tumor are very irregular, polygonal, and have variously shapen vesicular nuclei. In the sections where the growth in the mesentery is larger, the gland-like arrangement is very well marked. Sometimes the centre of the gland-like spaces is filled with blood cells.

Patient has been lost sight of.

The following cases have been collected from the literature:

CASE 1.—ROKITANSKY[60] (1847) (from Elting).—Autopsy on individual aged 82, who died of pulmonary disease. The appendix was transformed into a sac six inches in length and two inches in diameter and was adherent to the posterior side of the cæcum. The walls of the appendix appeared fibrous in character and the cæcal orifice of the appendix was obliterated and the sac thus formed contained a yellowish-white, gelatinous material.

CASE 2.—ROKITANSKY[60] (1854).—Individual aged 68, who died of pneumonia. The appendix was two inches in length and the distal two-thirds was transformed into a spindle-shaped fibrous sac about the size of a pigeon's egg, which contained a yellowish gelatinous material traversed by fine reticulated processes which took their origin from the wall of the sac.

CASE 3.—ROKITANSKY[60] (1866).—An individual aged 70, who died of heart disease. The appendix was four inches in length and the distal 2.9 inches was transformed into a sac distended with a gray gelatinous material. This portion of the appendix was about one inch in diameter and the wall was of a fibrous character; from it numerous delicate processes ran in different directions through the gelatinous contents.

CASE 4.—ROKITANSKY[50] (1866).—An individual 38 years of age, who died of pulmonary and intestinal tuberculosis. The appendix was 1.9 inches in length and consisted of two compartments. The distal, lined by a smooth mucosa, contained a grayish gelatinous material, while the proximal compartment was distended with a gelatinous material traversed by numerous delicate strands of tissue, which appeared to originate from the fibrous wall of the compartment.

There is some doubt as to the carcinomatous nature of these cases of Rokitansky as no mention is made of the microscopical structure.

CASE 5.—BEGER.[4]—Man aged 47. Three and a half years previously had an abscess in right iliac fossa which on operation yielded a pint of odorless pus; fistula remained and tumor grew through it. No escape of feces or flatus. Operation showed that fistula led directly to appendix which was everywhere infiltrated with carcinoma. The appendix was about six cm. in length and about the thickness of one's finger. At the base of the appendix, a walnut-sized papillary tumor projected into the cæcum. The patient died soon after the operation, and at autopsy metastatic involvement of the retroperitoneal glands was found. The microscopic diagnosis was adenocarcinoma.

Rolleston and Jones consider this to be the first authentic case of primary carcinoma of the appendix, and Elting, Baldauf and Zaaijer mention it in their lists of cases.

CASE 6.—DRAPER.[9]—Man aged 65. Healthy until three months previous when had alternating diarrhœa and constipation. Could not retain food for three months before death. Autopsy: Stenosis of ileocæcal valve. Proximal one-third of appendix dilated to size of a plum. Cæcal juncture also dilated and the thickened wall typical of colloid cancer. Peritoneum normal.

CASE 7.—STIMSON.[58]—Female, aged 44. Appendiceal attack lasting several weeks ten years previously. Well until two mild attacks two months before operation. "Cancerous degeneration" of appendix. Ring of thickened mucosa projecting into cæcum.

CASE 8.—MOSSE and DAUNIC.[41]—Female, aged 50. Had no appendiceal symptoms when she died of cardiac disease. Appendix only organ showing cancerous change. Tumor in mucosa and muscularis in part alveolar and in part cylindrical in type; lumen entirely obliterated.

CASE 9.—ROLLESTON.[51]—Female, aged 26. Operation during fourth appendiceal attack. First was fourteen months previous. Tip was adherent to ovary and was seat of primary, spheroidal-celled carcinoma size of a marble, which infiltrated almost to serosa. Other viscera appeared normal and were not suspected before microscopical examination. Three months later was losing flesh and strength. (Rolleston and Jones report that she was well five years later.)

CASE 10.—A. O. J. KELLY.[36]—Clinical history lost. Appendix 11 cm. in length; for 3 cm. at proximal end the diameter is 8 mm.; distal to this it is 1.2 cm. in diameter. There are areas of ulceration of the mucosa toward the proximal end, and just distal to these there is an area of tumor formation 6 mm. in diameter; this consists of a connective-tissue stroma which forms alveoli surrounding nests of epithelial cells. Diagnosis: Carcinoma. Good recovery, but since lost sight of.

Case 11.—A. O. J. Kelly.[36]—Mrs. E. S., aged 24. Three previous attacks, the last being three weeks before operation. No adhesions. Appendix 9 cm. in length and about 6 mm. in diameter. Lumen patent. Towards the base of the appendix its wall is infiltrated with narrow columns of cells apparently in intimate relation with the surrounding connective-tissue stroma, there being no sharp demarcation between the tumor cells and the stroma as in carcinoma. Diagnosis: Endothelioma. Patient was well when seen ten years later.

Case 12.—A. O. J. Kelly.[36]—J. M., man aged 19. Was well until nine days before operation, when he had symptoms of acute appendicitis with a palpable mass in the right iliac fossa. Operation: Small encapsulated collection of pus about cæcum and appendix, which latter was 5 cm. in length and 1 cm. in diameter. On removing a coating of fibrinopurulent exudate the appendix proved to be much distorted. A microscopically small growth was found almost entirely within the submucosa. The tumor cells were arranged in nests supported by a stroma of altered submucosa. Diagnosis: Carcinoma of the appendix. When seen about nine years after the operation patient complained of having had occasional pains in right iliac fossa and has had constant tenderness in the incision. No subsequent operations.

Case 13.—A. O. J. Kelly.[36]—T. R., man aged 63. Numerous appendiceal attacks shortly before operation. Appendix adherent, and like the intestines was studded with grayish white, miliary nodules. Retroperitoneal glands enlarged. Patient died from shock. Microscopical examination of the appendix showed it to be everywhere the seat of carcinomatous infiltration. The invading epithelial cells are sometimes in the form of nests and elsewhere form the walls of hollow tubules.

Case 14.—Hurdon.[21]—Mrs. G., aged 24. No symptoms pointing directly to appendix. Operation by Dr. Kelly for release of pelvic adhesions, suspension of uterus and removal of appendix; which latter was found densely adherent, and bulbous at its free extremity. There is a flexion between middle and outer thirds, and proximal to this the lumen is normal. To the distal side there is a soft concretion the size of a date stone, and situated in the intervening portion there is a small adenocarcinoma invading all coats. In good health when heard from nine months later.

Case 15.—Giscard.[18]—Male, aged 37. Mild attack eight months before a more severe one which led to operation in a few days. Abscess and local peritonitis. Obstruction of lumen at mid-appendix by cicatricial thickening, distal to which there was some pus. At this point microscopical examination showed a mixed adenoalveolar carcinoma situated between the mucosa and muscularis and occupying about one-half of the circumference. The tumor seemed to spring from the deeper layer of the glands. Good recovery.

Case 16.—Whipham.[43]—Female, aged 45. Abdominal swelling and tumor in right iliac region. Healthy until five weeks previous when had symptoms of malignant disease but none pointing to appendix. Inoperable. Mass of intestines and omentum. Died in two and a half months. Primary spheroidal-celled carcinoma in base of appendix invading all coats but serosa.

Of this case Rolleston and Jones say: "This case is excluded by several authors on the ground that there were growths also in the glands, liver, and the left ovary, which last they regard as the primary seat of the disease. It is, however, accepted by Moschcowitz, who agrees with Whipham that the origin in the mucous coat of the appendix shows that the growth was primary there, a view which we also take."

CASE 17.—SUDSUKI.[16]—Man, aged 40. Discovered at autopsy. Endothelioma the size of a pea found in the lower one-third of an appendix 11 cm. in length. Lumen patent and mucosa appears normal to the naked eye. Microscope shows it to be thin and devoid of epithelium and Lieberkuhn's glands. Submucosa compressed, and between it and the muscularis the tumor is found slightly infiltrating the latter and the serosa. Endothelium of lymph spaces much proliferated and it is believed that the tumor originated there.

CASE 18.—MCBURNEY.[17]—Woman, aged 23. Severe appendiceal attack two years previously. No adhesions. Two strictures, one near base and the other near apex, where there is a solid tumor the size of a pea. "Pure carcinoma." No metastasis.

CASE 19.—MCBURNEY[17] (Lartigau's case).—Man, aged 30. Discovered at autopsy. No history of appendicitis. "Pure carcinoma," somewhat larger than a pea in tip.

CASE 20.—GOFFE.[17]—Girl, aged 15. Increasing appendiceal pain for one year. No mass. Typical carcinomatous tumor 5 mm. in diameter developed in appendiceal wall at tip.

CASE 21.—REGLING.[18]—Man, aged 59. Attack preceded by anorexia for six months and for last six weeks had cramp-like abdominal pain. Abdomen distended. Lateral dulness disappearing on change of position. No tenderness or mass. Symptoms of obstruction led to operation. Tumor (scirrhous invading muscularis) size of hen's egg apparently starting from base of appendix invades outer side of cæcum for a short distance. Benign obliteration of free end of appendix; other end is a thick-walled dilatation filled with fish bones, etc. Stricture at ileocæcal junction due to adhesion of ileum and cæcum but not malignant. Carcinoma preceded by chronic inflammation. Fecal fistula and death in four months.

CASE 22.—JESSUP.[19]—Married woman, aged 36. Operation for ovarian cyst, following the last of five abortions. Appendix found surrounded by adhesions. Kink and constriction at junction of middle and distal thirds, beyond which there is a slight dilatation surrounding a firm, yellow adenocarcinoma infiltrating muscular coat. There were no symptoms pointing to appendix.

CASE 23.—HARTE and WILLSON.[19]—Maiden, aged 24. Appendiceal attack of one month's duration about five years previously. Numerous less severe attacks during entire winter one year previously, but made apparent recovery until one month before operation when symptoms returned. Operation. Appendix free from adhesions and to naked eye appeared to be normal externally and internally, except for almost entire obliteration of lumen. Local infiltration of all coats by scirrhous carcinoma 1 cm. from tip. Patient was well when recently seen seven and one-half years after operation.

CASE 24.—HARTE and WILLSON.[33]—Frank L., aged 25 (in service of Dr. Le Conte). More or less continuous pain in right iliac fossa for eight months. Operation: Appendix adherent behind cæcum and ruptured near tip. Concretion size of grape seed. Sections of appendix about one centimetre from tip showed a carcinoma simplex springing from the mucosa and involving all coats. Acute suppurative appendicitis. Good recovery until four and one-half months later when he had symptoms of intestinal obstruction from a band of adhesions, and bowel found to be gangrenous. No evidences of malignancy. No autopsy.

CASE 25.—WEIR.[61]—Man, aged 23. History of thirteen attacks of appendiceal pain in two years. Nothing felt through abdominal wall. Appendix strongly kinked and knobbed a little at its end. Pathological Report: Usual inflammatory changes in mucous membrane and a small mass of adenocarcinoma at the tip. Patient remained in good health for three years and was then lost sight of.

CASE 26.—WALSHAM.[57]—Man, aged 45. Had several appendiceal attacks. Operation: The appendix was thickened and ulcerated and when examined microscopically was found to be the seat of a columnar-celled carcinoma.

CASE 27.—NORRIS.[44]—Mrs. L. F., aged 27. No symptoms pointing directly to appendix. Operation for right inguinal hernia and salpingitis. Appendix reddened and adherent at tip, where lumen was occluded by a firm, yellowish-white mass in its terminal centimetre; here there was an old obliteration, but elsewhere evidence only of a mild chronic inflammation. Carcinoma simplex. Well when seen four years later.

CASE 28.—MOSCHCOWITZ.[40]—I. S., male, aged 37. Treated three years for supposed alcoholic gastritis. Later acute appendiceal attack with peritonitis. Operation: Free pus in abdomen. Appendix adherent and slightly gangrenous. Bean-sized adenocarcinoma in tip. No recurrence six and a half years later.

CASE 29.—MOSCHCOWITZ.[40]—R. P., female, aged 20. Ten-day appendiceal attack. Tenderness. No mass felt. Small hard nodule one inch from tip. Carcinoma simplex. No recurrence three years later when lost sight of.

CASE 30.—MOSCHCOWITZ.[40]—Mrs. G. D., aged 24. Five months pregnant. Present attack of five months' duration. Irregular fever. Leucocytes, 17,500. Pain in hypogastrium. Exploratory laparotomy negative, except for appendix adherent at tip; here lumen was obliterated and a colloid carcinoma found. No recurrence six months later.

CASE 31.—LETULLE and WEINBERG.[35]—Male. Discovered at autopsy after death from tuberculosis. Total obliteration of lumen. Small adenocarcinoma at tip starting from centre of old cicatrix.

CASE 32.—LETULLE and WEINBURG.[44]—Child, aged 12½. History of mucomembranous colic since infancy. Two attacks of appendicitis at interval of one year. Operation after second attack. Appendix adherent and contained an enterolith. A carcinoma of the adenocarcinomatous type was located at a point at which a stenosis had resulted from previous inflammation. Good recovery.

CASE 33.—LETULLE and WEINBURG.[45]—Female. Discovered at autopsy after death from pulmonary tuberculosis. Obliteration of lumen in distal 2 cm., where there was an adenocarcinoma below an old cicatrix.

CASE 34.—LETULLE.[44]—L. L., male, aged 35. Discovered at autopsy after death from tuberculosis of lungs and intestines. Adenocarcinoma size of cherry stone in tip. No adhesions.

CASE 35.—LETULLE.[44]—A. M., female, aged 39. Discovered at autopsy after death from tuberculosis of lungs, kidneys and intestines. Tumor size of hazelnut in tip with obliteration of terminal 4 cm. of lumen. Secondary to acute appendicitis. No adhesions.

CASE 36.—LETULLE.[44]—V. C., female, aged 59. Discovered at autopsy after death from pulmonary and intestinal tuberculosis. Adenocarcinoma of distal end with obliterated lumen at this point only. No adhesions.

CASE 37.—LETULLE.[44]—J. P., female, aged 26. Discovered at autopsy after death from pulmonary tuberculosis. Scirrhous cancer size of cherry stone in tip. Overlying peritoneum normal. Adhesions over cæcal half of appendix, which is chronically inflamed. Meso-appendix involved.

CASE 38.—LEJARS.[43]—Male, aged 27. Slight appendiceal attacks for three months, becoming more severe. At time of appendectomy cæcum looked normal and there were no adhesions or swollen mesenteric glands. Second operation two months later. General metastasis. Microscopically no portion of appendix proved to be free from carcinoma. Polyhedral-celled type of trabecular tendency.

CASE 39.—ELTING.[11]—Mrs. L., aged 36. Good health until eight years previously, when she had an attack diagnosed peritonitis. No more trouble until shortly before she had a bilateral salpingo-oöphorectomy. No symptoms of appendicitis. Appendix, although apparently normal, was removed as a precautionary measure and was found to contain a small alveolar carcinoma 1 cm. from the proximal end. Lumen everywhere obliterated. In good health three years later.

CASE 40.—ELTING.[11]—W. D., male, aged 81. Autopsy after death from pulmonary tuberculosis and cardiac disease. No symptoms of appendicitis. Colloid carcinoma of appendix. No metastasis.

CASE 41.—EDINGTON.[12]—Mr. P., aged 44. Diagnosed appendicitis. Had symptoms of "stomach catarrh" for two years. Operation: Body of appendix buried in adhesions (mesoappendiceal and enlarged glands) but tip was free. Proximally the appendix was quite narrow, distally thick, hard and bulbous. On passing the hand toward the pylorus, a hard band of omentum was found kinking the bowel and was removed. Patient gradually became weaker and died in three months. Microscopical examination shows a general adenocarcinomatous infection. All coats are involved.

CASE 42.—KAUFMANN.[25]—Woman, aged 31. Discovered at autopsy after death from typhoid fever. Muscular coat of appendix almost destroyed by a diffuse, solid, round-cell carcinoma.

CASE 43.—JONES and SIMMONS.[24]—Female, aged 26.—Six appendiceal attacks in twelve years. Tenderness, but no mass. Adhesions seen with microscope only. Scirrhous carcinoma near base. Small section of cæcum removed at second operation and found to be normal. Also chronic appendicitis. Good recovery and well eight months later.

CASE 44.—ECCLES.[11]—Male, aged 18. Two typical appendiceal attacks in two months. Adherent thickened appendix. Two separate, small tumor masses in wall of appendix; one at junction of proximal and middle two-thirds and the other a little more distal. Spheroidal-cell cancer. Was well twenty-two months later.

CASE 45.—CULLINGSWORTH and CORNER.[8]—Maiden, aged 31. Two attacks of pain in right side in two weeks. Operation for fibromyoma of broad ligament. Appendix was removed on account of bulbous extremity which was found to contain a small spheroidal-cell carcinoma. Lumen obliterated at tip only. Eight months later patient was well but had no appetite.

CASE 46.—BURNAM.[6]—Man, aged 25. Recurrent appendiceal pain for two years. Appendix adherent to its meso at tip and acutely inflamed, especially to outer third where adenocarcinoma fills lumen and invades mucosa and muscularis.

CASE 47.—WEIR.[61]—Male, aged 22. Emaciation, cough and abdominal distention, with ascites for two months. Was thought to have tubercular peritonitis but the fluid injected into guinea pigs gave negative results. Operation revealed a large number of subperitoneal metastatic nodules but none in viscera. Transformation of appendix into a mass of mucoid carcinoma. No adhesions.

CASE 48.—WEINBERG.[60]—M. J., male, aged 22. Two appendiceal attacks, six years and one year previously. Lumen obliterated in terminal 2 cm., and here author thinks there is absolute proof that the epithelium has developed in an obliterating cicatrix, at the expense of a portion of a gland which escaped the inflammatory process and was caught in the cicatrix. Patient well four months later.

CASE 49.—SARGENT.[52]—Girl, aged 12. First attack. Abscess. Appendix acutely inflamed. Changes most marked beyond a pea-sized tumor which obstructs lumen half an inch from cæcum. Endothelioma. Was well five months afterwards. (The microscopical section from this case was seen by Rolleston and Jones who say that it is very difficult to state positively that it is not a spheroidal-cell carcinoma.)

CASE 50.—NERI.[41]—E. B., male, aged 29, who had repeated attacks of pain in the cæcal region following a kick in that part five years previously. The appendix, removed at operation, showed a primary adenocarcinoma in the middle of a chronically inflamed organ. There was no metastasis.

CASE 51.—MYERSTEIN.[42]—Female, aged 26. Discovered at autopsy after death from hæmoptysis. Carcinoma simplex with traces of alveolar type invading all coats in distal half of appendix.

CASE 52.—KUDO[30] (Einlauf No. 876, 1905, Prosektor).—Boy, aged 8. Operation for acute perityphlitis. Tumor size of a pea in middle of appendix, invading submucosa. Muscularis and serosa not invaded. Carcinoma simplex.

CASE 53.—KUDO[30] (sections Jour. No. 549, 1905, Path. Inst.)—Man. No history of appendicitis. Autopsy: Appendiceal opening enormously dilated and hard tumor the size of a walnut protrudes 1 cm. into cæcum. Adenocarcinoma with transition into carcinoma simplex.

CASE 54.—KUDO[30] (Einlauf, No. 1507, 1905, Prosektor).—Man, aged 35. Acute appendicitis. Nodule size of a pea springing from mucosa at tip. Muscularis but slightly invaded. Carcinoma simplex.

CASE 55.—KUDO.[30]—Woman, aged 26. Tumor size of a cherry obstructing lumen in proximal end. Middle third obliterated. Carcinoma simplex.

CASES 56-57-58.—KORTE.[29]—Unexpectedly came across three cases of carcinoma of the appendix in youthful individuals from 12 to 28 years of age. Once in an interval operation and twice while operating for acute appendicitis. Microscopical diagnosis of all three was adenocarcinoma and all were living at the time they were reported.

CASE 59.—H. KELLY[28] (Thorndike, Boston City Hospital).—Woman, aged 30. Seven years of recurrent appendicitis, becoming severe one week before operation. Appendix thickened; distal portion cystic, and base indurated and carcinomatous. A portion of cæcum removed with appendix. Microscopical Examination: Small alveoli lined with columnar cells, which often entirely fill the lumen. All coats to serosa involved. Uneventful recovery.

CASE 60.—H. KELLY[28] (Monks, Boston City Hospital).—Woman, aged 24. First attack; two days' illness and epigastric pain becoming localized in right iliac fossa. Moderate tenderness to left and below umbilicus. Operation: Appendix twisted on itself. Bulbous tip enveloped in mass of inflammatory exudate. Easily separated. Yellowish nodule 0.6 cm. in diameter, 1.5 cm. from tip. Adenocarcinoma replacing mucosa and invading muscularis. Slight chronic appendicitis. Uneventful recovery.

CASE 61.—H. KELLY[28] (J. H. H., Surg., No. 9037).—Colored man, aged 19. History of abdominal cramps (recurrent) but no definite appendiceal attacks. Symptoms of acute appendicitis for ten days and extremely painful mass in right iliac fossa which proved to be omentum surrounding a small fetid abscess. Temperature, 101.8° F.; pulse, 110; leucocytes, 16,000. Appendix thickened and adherent to wall of abscess. Two cm. of median portion of lumen obliterated by an alveolar carcinoma invading all coats. Small perforation at distal end of tumor. Uneventful recovery.

CASE 62.—DRIESSEN.[10]—Removed an appendix from a young married woman after a third attack of appendicitis. The appendix showed a small alveolar carcinoma in the middle of a chronic inflammatory mass which obliterated the lumen of the organ at its middle. There had been no recurrence after five and a half years.

CASE 63.—BATTLE.[3]—Girl, aged 14. Four appendiceal attacks in one year. Operation: Mass of omentum adherent to bowel. Appendix removed with difficulty. Was twisted on itself. One constriction near distal end which cut off marble-like portion full of pus, and another a little nearer cæcum beyond a hard, yellowish-white, spheroidal-celled carcinoma the size of a marble.

CASE 64.—BARROW.[2]—A. H., girl, aged 18. First attack. Symptoms of appendicitis following diphtheria; together of one month's duration. Bulbous tip of appendix adherent to posterior wall of cæcum. Local area of inflammation in cæcum, colon and ileum but apparently no malignant infiltration. Mesenteric glands enlarged. Cancerous involvement of bulbous, distal one-third of appendix only, where there were two small tumor nodules. Polymorphous type.

CASE 65.—BALDAUF[1] (Bender Lab. 128–1904).—Mr. H., aged 38. Previously well. Symptoms of appendicitis the day before operation. Appendix bound down by adhesions and underneath umbilicus. Beginning peritonitis. Easy removal. Uneventful recovery. Pathological Examination: Appendix considerably thickened and covered with fibrin. Lumen patent. Mucosa injected and the seat of foci of necrosis. Anatomical Diagnosis: Acute appendicitis. Microscopical Examination: At mesenteric side, mucosa is ulcerated and replaced by a new growth invading all coats and infiltrating meso. Microscopical Diagnosis: Carcinoma simplex with ulceration. Acute appendicitis. Periappendicular suppuration.

CASE 66.—BALDAUF.[1]—Mr. B., aged 23. Two appendiceal attacks six and five months previous, and a last beginning five days before operation. Clinical Diagnosis: Subacute appendicitis. Appendix removed with difficulty. Pathological Examination: Obliteration of lumen. Fibrous tags externally. Tumor not suspected until Microscopical Examination: Mucosæ replaced by carcinoma simplex invading muscularis, and to mesenteric side, subserous tissue.

CASE 67.—BALDAUF.[1]—Girl, aged 8. Previous history negative. No symptoms referable to appendix until two days before operation, when she had a severe appendiceal attack. Appendix surrounded by inflammatory mass which ruptured during removal and a small amount of pus escaped. Pathological Examination: Proximal half normal, other end thickened and indurated and surrounded by a layer of partially organized tissue. Lumen normal. Anatomical Diagnosis: Partial organization of periappendicular abscess. Microscopical Examination: Carcinoma simplex involving submucosa. Muscularis uninvolved.

CASE 68.—WARTHIN.[50]—Married woman, aged 32. Salpingitis with mass of adhesions involving ovary, appendix, cæcum and small intestine. Appendix alone carcinomatous and lumen obliterated. No naked eye evidences of malignancy. Microscope showed involvement of all, including proximal, sections so condition may have extended into cæcum. Basal-celled carcinoma. Was well three years later.

CASE 69.—LANDAU.[51]—Woman, aged 33. Currettement at eighteen followed by violent local peritonitis. Operation for removal of myoma of uterus and left-sided adnexæ. Removal of appendix which was rigid, bent on itself in several places and thickened at the apex. Its mesentery adherent to colon. Length 6.5 cm. Proximal half short and normal; tip hard. No enlarged glands. Microscope shows carcinoma simplex.

CASE 70.—ZAAIJER.[64]—Woman, aged 37. Chronic appendicitis with exacerbations. Numerous adhesions found at operation. Chronically inflamed mucosa with traces of acute abscess formation. Pea-sized tumor at apex showing, histologically, a solid alveolar carcinoma. Walls infiltrated to subserosa.

CASE 71.—ZAAIJER.[64]—Girl, aged 20. Symptoms of hysteria and chronic appendicitis. Operation: Appendix somewhat thickened, with focal, chronic periappendicitis. At apex, an obliteration 1 cm. in length was the seat of an extremely small neoplasm (0.5 x 1.1 x 1.1 mm.). No apparent connection between this and the surface or glandular epithelium. Diagnosis: Carcinoma solidum diffusum.

Patient showed no evidence of recurrence fourteen months later.

CASE 72.—ZAAIJER.[64]—Miss —., aged 26. Vague abdominal symptoms for several years culminating finally in a well-marked appendicitis. Appendix firmly adherent, with tumor 3½ cm. long in tip. Mixed adeno- and cylindrical-celled carcinoma. Infiltration of mesentery, and extension along blood vessels to peritoneum. No sign of recurrence six months later.

CASE 73.—ZAAIJER.[64]—Man, aged 25. Chronic relapsing appendicitis for thirteen years. Operation: Marked adhesive periappendicitis. Mucosa and glandular tissue atrophic. Submucosa greatly thickened. Gelatinous mass size of a lima bean in apex. Appearance was that of colloid cancer, although positive proof of this could not be given even with the microscope.

CASE 74.—ZAAIJER.[64]—Girl, aged 23. Appendectomy one month after a first, slight attack of appendicitis. Appendix showed a marked chronic inflammation, with a pea-sized tumor near the tip, projecting polyp-like into the lumen. Infiltration of submucosa, muscularis and mesentery. Tumor was partly adenomatous and partly of the solid type. No evidence of recurrence two and a half years later.

CASE 75.—ZAAIJER.[64]—Girl, aged 12. Appendectomy one month after first attack. Evidences of chronic appendicitis, especially in subserosa. In the tip was found a bean-sized carcinoma of the round-celled type which had compressed the surrounding tissues but had infiltrated the muscularis at but one point. No evidence of recurrence after three years.

CASE 76.—ZAAIJER.[64]—Girl, aged 17. Appendectomy after two weeks of appendicitis. Stricture 2 cm. from tip. Proximal portion of stricture contained a pea-sized carcinoma of the solid type with adenomatous tendency.

CASE 77.—SCHRUMPF.[54]—Woman, aged 35. Discovered at autopsy after death from transverse myelitis. Small, hard tumor the size of a hazelnut at distal end of appendix. Serosa pale and unirritated. Mucosa replaced by adenocarcinoma which infiltrates the submucosa and at one point the muscularis.

CASE 78.—PATEL.[46]—Man, aged 58, who had had double inguinal hernia for twenty-five years. For last two months the right hernia was painful and of late could not be returned as formerly. Operation: Appendix found lying free in sac with its tip distended and filled with small foreign bodies, one of which resembled a fish bone and another a scale of enamel. The wall was thick and hard and on microscopical examination the tip was found to be the seat of a scirrhous carcinoma. Good recovery.

CASE 79.—MASON and RHEA.[36]—F. H., housewife, aged 22. Three gynæcological operations in three years. During the last the appendix was removed although apparently normal and microscope showed scirrhous cancer in tip. No metastases found in the other organs examined.

CASE 80.—HESSBERG.[22]—Female, aged 76. Found at autopsy. No history of appendiceal trouble. Appendix sprung from posterior wall of cæcum and was wound around latter so that appendiceal lumen was only visible to microscopical examination. Tumor nodules the size of a pea. Carcinoma simplex.

CASE 81.—HENKING.[20]—Man, aged 23. History of diarrhœa. Appendix removed two years ago; ever since has had pain in right iliac fossa which has increased in the last three months. Six months before lost a pint of blood by bowel. Abdomen tender, especially in right iliac fossa, where there is dulness and fluctuation. Operation: Abscess in scar tissue. Second operation ten days later. Medullary carcinoma of stump of appendix invading ileum and cæcum which were resected. Gelatinous swelling of peritoneum.

CASE 82.—GRÜNBAUM.[18]—Female, aged 19. Violent pain in cæcal region one month before admission. During operation for pyosalpinx appendix was found adherent to reddened and enlarged ovary. Tip of appendix thickened and the seat of a yellowish, dense carcinoma simplex invading all coats. Mesenteric glands uninvolved. No metastasis into tubes or ovaries.

CASE 83.—BRANDTS.[5]—Boy, aged 8. Ten weeks before admission had pain in right iliac fossa, fever, distention, and obstinate constipation. Second attack six weeks later and third attack four days before operation with vomiting, etc. Operation: Intestines covered with fibrin. Appendix was perforated to the proximal side of a small mass. Removal. Appendix 6 cm. in length.

Microscope shows the small mass to be a solid carcinoma to which the perforation was secondary. Necrotic inflammation. The carcinoma produced stenosis, and inflammation followed.

CASE 84.—BRANDTS.[5]—Man, aged 35. Had pain in right hypochondrium for several years; was frequently jaundiced and had clay-colored stools. Also attacks of pain in right iliac fossa. Physical Examination: Tenderness over gall-bladder and appendix. No tumor in liver region. Operation: Gall-bladder and ducts negative. Appendix 8 cm. long with small tumor in its tip. Microscopical Examination: Scirrhus, with suspicion of adenocarcinoma.

CASE 85.—MCWILLIAMS.[38]—Maiden, aged 20. Never sick until had typical, acute appendiceal attack on arrival at Ellis Island. Three ounces of pus evacuated. Enteroliths and muco-pus in lumen, also spheroidal-celled scirrhous cancer size of a pea in tip. All coats but serosa invaded.

CASE 86.—OBERNDORFER,[45] in speaking of small intestinal cancers that had come under his observation, mentions a carcinoma of the appendix in a boy of seven years of age. As no details are given, this case is of a doubtful nature.

CASE 87.—WHITE.[65]—Woman, aged 75, died on the ninth day of an attack of acute intestinal obstruction due to a Richter's hernia into the right femoral ring. Thirty-five years previously she had what seems to have been an attack of acute appendicitis. At autopsy the appendix was found bound down to the posterior wall of the abdomen by dense adhesions and was two and one-half inches in length and, toward the distal extremity, one-half inch in diameter. Microscopically there was an irregular overgrowth of epithelium invading the deeper tissues. In places there was a glandular formation, but most of the cells had undergone a complete colloidal degeneration. A single gland at the ileocæcal angle was enlarged to the size of a cherry and proved to be carcinomatous. The cæcum and other viscera were free from infection.

CASE 88.—A. O. J. KELLY.[67]—Mrs. S. B., aged 23. Severe appendiceal attack five years, and mild attack four weeks before. Constipated since first attack. Palpation negative except for local tenderness. Operation: Appendix kinked on itself and curled around cæcum. Appendix cut out of cæcum. On section a new growth is seen to extend from the tip, almost if not quite, to the proximal end. All coats are invaded and the thickness of the organ is increased. The lumen is almost completely occluded except at proximal end. Microscopically there are lesions of chronic appendicitis with evidences of acute exacerbation. The epithelial cells are arranged in nests and some have undergone mucoid change. In good health one year after operation.

CASE 89.—A. O. J. KELLY.[67]—Miss F. L. B., aged 17. Eight hours before admission to hospital was seized with acute, general abdominal pain, gradually becoming localized in right iliac region. Abdomen rigid on right side and local tenderness over McBurney's point. No mass. Operation: The appendix, which was nonadherent, was 9.5 cm. in length and about 1 cm. in thickness, the distal 6 cm. being the more distended. The serosa was coated with fibrin. About midway a well-marked constriction was found separating proximal and distal portions, and the latter was filled with a sanguinopurulent material. Macroscopical evidences of a new growth were first seen while sections were being prepared for microscopical examination. A small infiltration of the submucosa, opposite the mesentery, extended 1.5 cm. from the constriction to the proximal end. Microscopically there were evidences of a moderate grade appendicitis. The tumor consisted of narrow columns of cells infiltrating the submucosa. In some regions the origin of the cells from the endothelial lining of the lymph channels is obvious in their lining such spaces. Microscopical Diagnosis: Endothelioma and acute appendicitis.

CASE 90.—A. O. J. KELLY.[67]—Miss L. B., aged 27. During last two years has had severe attacks of pain in upper right abdominal quadrant. During first attack had a chill and pain was referred to right shoulder. Was jaundiced for two months. Operation: Gall-bladder normal. Appendix 8 cm. long and 0.3 thick, except for a bulbous enlargement 1.3 cm. at tip. New growth was not observed on macroscopical examination, but was later found to comprise a small nodule about 3 mm. in diameter extending 2 cm. from the tip of the organ. The tumor consists of nests of epithelial cells supported by a well-developed connective-tissue stroma; the submucosa especially is the seat of the infiltration, but the muscularis is also slightly invaded even to the subserosa. Diagnosis: Carcinoma and chronic appendicitis with exacerbation. Uneventful recovery.

CASE 91.—A. O. J. KELLY.[37]—Miss M. K., aged 28. Previously well. Attack began a few days before operation with severe cramp-like pains in abdomen which became localized in right iliac fossa. There was marked rigidity and tenderness of the right abdomen, with nausea and vomiting, and a definite mass could be palpated. Operation: Considerable pus evacuated. Appendix acutely inflamed, perforated and adherent to colon. The appendix was 6 cm. long and from 0.6 to 1.5 cm. in thickness. The tip was much dilated—the lumen to 0.8 mm. in diameter and contained a hard calculus. The tumor could only be detected with the microscope, which revealed evidences of acute inflammation and showed the new growth to be limited to the tip. It consists of nests of epithelial cells, in a well-developed connective-tissue stroma, replacing the mucosa and infiltrating the muscularis. Diagnosis: Carcinoma and acute ulcerative appendicitis with perforation. Uneventful recovery.

CASE 92.—LE CONTE.[82]—T. R., woman, aged 21. Attacks of sharp pain in appendiceal region for ten years. Final attack lasted one week. Violent pain, soreness and palpable tumor size of a hickory nut in same region, and nausea.

Intussusception of appendix into cæcum with tip protruding. Ileocolic glands enlarged. Portion of cæcum excised with appendix, and pathological report suggested a wider carcinomatous involvement. Six weeks later a more extensive resection was performed with removal of seven inches of bowel and a number of mesentric glands, two of which showed metastatic involvement from the primary adenocarcinoma in the appendix.

FOLLOWING ARE THE BRIEF RÉSUMÉS OF THE CASES OF SARCOMA OF THE APPENDIX.

CASE 1.—GILFORD[14] (Sarcoma).—Woman, aged 27, with symptoms of chronic appendicitis for thirteen years. Spindle-cell sarcoma of appendix which was adherent to colon and ileum, which were uninvolved.

CASE 2.—GLAZEBROOK[16] (Sarcoma).—G. G., colored man, aged 55. Discovered at autopsy after death from apoplexy. Appendiceal adhesions. Dense, fibrous, endothelial sarcoma the size of a pigeon egg, near tip. Originated in serosa and invaded all coats.

CASE 3.—WARREN[88] (Sarcoma).—Boy with symptoms of chronic appendicitis, intermittent pain, and fever for one month. Tumor of ileocæcal angle with involvement of appendix. Round-cell sarcoma with glands extending to root of mesentery. Was well four years later.

CASE 4.—PATTERSON[41] (Sarcoma).—Man, aged 39. History of uneasiness in right iliac fossa for three months. Occasional sharp pain. No vomiting until acute attack before operation. Tender mass in appendiceal region. Operation: Appendix thick, firm, and adherent. Cæcum thickened for one-quarter inch about appendix. Thickened portion of cæcum removed with appendix. Patient died six hours later. Autopsy: No trace of tumor elsewhere. Round-cell sarcoma beginning in appendix and involving all coats with exception of serosa.

CASE 5.—CARVARDINE[7] (Sarcoma).—Female, aged 45. Symptoms of appendicitis for five months. Severe pain in right iliac fossa, diarrhœa and frequent attacks of severe colic. Tenderness and deep-seated swelling in same region. Operation: Appendix three and a half inches long and the size of one's thumb; very hard; adherent; olive-shaped tip. Cæcum not involved but head and neighboring enlarged gland removed. Recurrence on left side. Death nine months later. Microscope shows lymphosarcoma.

CASE 6.—CARVARDINE[7] (Sarcoma).—Man. Appendix removed for relapsing appendicitis. The central portion contains a small fecal concretion, and in the apex there is a whitish tumor the size of a hazelnut. Several of the neighboring glands are enlarged. Microscopically the tumor consisted almost entirely of lymphoid tissue. Author speaks of it as a lymphosarcoma (also as a lymphocytoma).

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